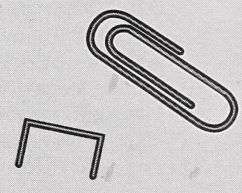
AL.2.2003-22

University of Alberta Library
0 1620 3409935 6

Pure MATHEMATICS 30

Module 6
Combinatorics
Assignment Booklet 6A



Learning Technologies Branch

Alberta LEARNING

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Section 1 Assignment	40	

Teacher's Comments

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Parents	
General Public	
Other	

Pure Mathematics 30
Module 6: Combinatorics
Assignment Booklet 6A
Section 1 Assignment
Learning Technologies Branch
ISBN 0-7741-1728-1

ALL RIGHTS RESERVED

Copyright © 2000, the Crown in Right of Alberta, as represented by the Minister of Learning, Alberta Learning, 11160 Jasper Avenue, Edmonton, Alberta T5K 0L2. All rights reserved. Additional copies may be obtained from the Learning Resources Distributing Centre.

No part of this courseware may be reproduced in any form, including photocopying (unless otherwise indicated), without the written permission of Alberta Learning.

Every effort has been made both to provide proper acknowledgement of the original source and to comply with copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Learning so that appropriate corrective action can be taken.

IT IS STRICTLY PROHIBITED TO COPY ANY PART OF THESE MATERIALS UNDER THE TERMS OF A LICENCE FROM A COLLECTIVE OR A LICENSING BODY.

UNIVERSITY LIBRARY
UNIVERSITY OF ALBERTA

ASSIGNMENT BOOKLET 6A
PURE MATHEMATICS 30: MODULE 6
SECTION 1 ASSIGNMENT

Your mark for this module will be determined by how well you do your assignments in the Assignment Booklets.

This Assignment Booklet is worth 40 marks out of the total 100 marks for Module 6.

Work slowly and carefully. If you are having difficulties, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

(40)

Section 1 Assignment: Permutations and Combinations

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

1. Express each of the following as a product.

(1) **a.** $6!$

(1) **b.** ${}_7C_2$

(1) **c.** ${}_8P_3$

2. Express each of the following expressions in the form ${}_nP_r$ or in the form ${}_nC_r$.

(1) **a.** $\dfrac{27\times26\times25\times24}{4\times3\times2\times1}$

(1) **b.** $30\times29\times28\times27\times26$

3. A ski trip at the school has been arranged. There are 30 students that have paid for the trip and 6 parents that have volunteered to chaperone. To transport the students and parents easily, they are to be divided into two groups. One group has 10 students and 2 parents, and the other group has 20 students and 4 parents.

(2) **a.** How many different groups of 10 students can be formed?

(2) **b.** How many different groups consisting of 10 students and 2 parents are possible?

(3) **c.** Kelly is one of the students going on the ski trip, and Kelly's mother volunteered to be one of the chaperones. Kelly's mother would prefer to be in the smaller group and not in the same group as Kelly. If this wish is honoured, how many ways can the smaller group and its chaperones be chosen?

4. A personal identification number (PIN) is used for banking at automated teller machines (ATMs). For security reasons, bank personnel suggest that you do not use your date of birth in sequential order as your PIN. Kerri is a forgetful person. She decides to use numbers from her date of birth, but plans to mix up the numbers.

Kerri was born on June 23, 1978 (written 23/06/78 on her driver's licence). Therefore, the numbers she plans to use for her 4-digit PIN are 2, 3, 0, 6, 7, and 8.

(2) **a.** How many different 4-digit PINs can be created using the numbers from this set with repetition?

(2) **b.** How many different 4-digit PINs can be created using these numbers without repetition?

(2) **c.** If Kerri does not include PINs 2306, 2378, 0623, 7823, 7806, and 0678 because they contain part of her date of birth, how many different PINs does she have to choose from if no digits are repeated?

_____

_____

_____

5. The binary system is used for computer programming. A binary number consists of a string of digits that are either 0s or 1s.

(1) **a.** If a string of binary code is 5 digits long, how many binary numbers are possible if the first digit is a 1?

(1) **b.** How many different binary numbers can be represented by a string of binary code with 5 digits if the first digit is 1 and the last two digits are 0?

6. A school must choose a 4-student debate team to go to Winnipeg for a competition. There are 11 males and 15 females that are trying out for the team, all of whom are equally qualified.

(2) **a.** How many different debate teams can the school form from the applicants?

(2)

b. If the debate team must consist of 2 females and 2 males, how many different teams can the school form?

(2)

7. The number of ways of choosing 4 people from 12 people is the same as the number of ways of choosing 8 people from 12 people. Explain why these tasks can be done in the same number of ways.

8. On a popular television game show, contestants must first answer a question by placing 4 given events in ascending or descending order in the quickest time.

(1)

a. If a contestant does not know how any of the events should be arranged, how many different ways could the question be answered?

(3)

b. A contestant has to arrange the events that correspond to A, B, C, and D. One contestant is positive that event D follows directly after event B, but does not know about the others. How many different ways could this contestant arrange the letters A, B, C, and D? List the possibilities.

9. A popular board game involves guessing which 1 of 6 characters committed murder in 1 of 9 rooms with 1 of 6 possible weapons.

(2)

a. How many different guesses can be made if 1 character, 1 room, and 1 weapon must be guessed?

(2)

b. You are dealt 6 cards that allow you to eliminate 2 characters and 4 rooms. How many different guesses remain if 1 character, 1 room, and 1 weapon must be chosen?

(3) **10.** At a family reunion, everyone shakes everyone else's hand once. Not one person shakes someone else's hand twice. If a total of 190 handshakes take place, how many people were at the reunion?

(3) **11.** How many different ways are there to arrange the letters in the word ARRANGE?

AL.2.2003-22
NO ILL
c.2 v.6(b)

Pure MATHEMATICS 30

Module 6

Combinatorics

Assignment Booklet 6B

Learning Technologies Branch

Alberta LEARNING

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Section 2 Assignment	35	
Final Module Assignment	25	
	60	

Teacher's Comments

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Parents	
General Public	
Other	

Pure Mathematics 30
Module 6: Combinatorics
Assignment Booklet 6B
Section 2 Assignment and Final Module Assignment
Learning Technologies Branch
ISBN 0-7741-1730-3

ALL RIGHTS RESERVED

Copyright © 2000, the Crown in Right of Alberta, as represented by the Minister of Learning, Alberta Learning, 11160 Jasper Avenue, Edmonton, Alberta T5K 0L2. All rights reserved. Additional copies may be obtained from the Learning Resources Distributing Centre.

No part of this courseware may be reproduced in any form, including photocopying (unless otherwise indicated), without the written permission of Alberta Learning.

Every effort has been made both to provide proper acknowledgement of the original source and to comply with copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Learning so that appropriate corrective action can be taken.

IT IS STRICTLY PROHIBITED TO COPY ANY PART OF THESE MATERIALS UNDER THE TERMS OF A LICENCE FROM A COLLECTIVE OR A LICENSING BODY.

ASSIGNMENT BOOKLET 6B
PURE MATHEMATICS 30: MODULE 6
SECTION 2 ASSIGNMENT AND FINAL MODULE ASSIGNMENT

Your mark for this module will be determined by how well you do your assignments in the Assignment Booklets.

This Assignment Booklet is worth 60 marks out of the total 100 marks for Module 6.

Work slowly and carefully. If you are having difficulties, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

(35)

Section 2 Assignment: Pathways, Pascal's Triangle, and the Binomial Theorem

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

(3)

1. The first three terms in one of the rows in Pascal's triangle are 1, 10, and 45. Determine the next two terms in this row.

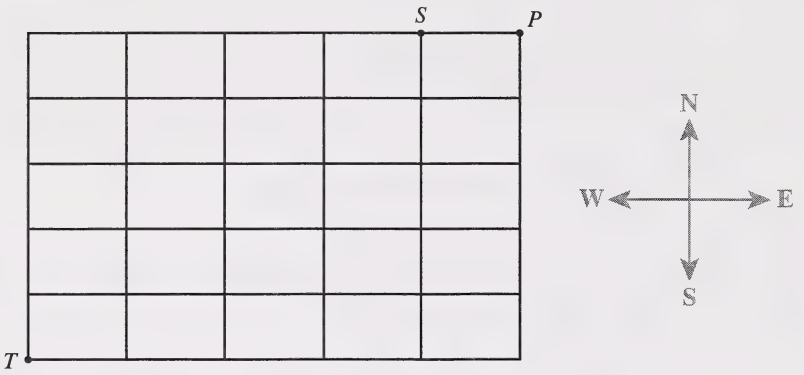
(1)

2. There are 15 terms in the expansion of the binomial $(a+b)^n$. Determine the value of n.

(3)

3. a. The following grid is a simplified map of a condominium complex. The swimming pool is located at point P, the tennis courts are located at point T, and a store is located at the point labelled S.

Determine the number of different paths a person could take to get from the tennis courts to the swimming pool.



(3)

b. What percentage of the total paths from the tennis courts to the swimming pool pass through the point labelled S?

(3) **4.** A committee of at least 2 people is chosen from a group of 8 people. The number of different committees that can be formed from the 8 people can be calculated with the aid of Pascal's triangle. Explain how knowledge of Pascal's triangle makes this question easier; then determine how many different committees can be formed.

5. State whether or not the following variables or constants appear in the expansion of $(x+y)^{11}$. Explain.

(1) **a.** x^{12}

(1) **b.** $x^{10}y$

(1) **c.** x^5y^5

(1) **d.** a constant

6. Expand the following binomials.

(2) **a.** $(x+2)^4$

(3) **b.** $(2x-1)^5$

(3) **c.** $(x+3y)^3$

(3) **7.** One of the terms in the expansion of $(x+3)^7$ is kx^5. Determine the value of k.

(3) **8.** Determine the coefficient of the middle term in the expansion of $(2x-3)^{10}$.

(2) **9. a.** The letters in the word SPORT are arranged in the shape of a diamond. Starting from the top of the array, move downwards diagonally to the left or right. How many different paths spell the word SPORT?

(2) **b.** How many of these paths will pass through the O in the middle of the diamond?

25

Final Module Assignment

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

(2)

1. Sandra claims she can always tell the difference between diet pop and regular pop. To test her claim, her friend, Lyle, set up an experiment. Lyle lines up 5 cups of pop (labelled Cup 1, Cup 2, Cup 3, Cup 4, and Cup 5) on a table. Sandra then tastes each cup and records *D* if she thinks it is diet pop or *R* if she thinks it is regular pop on a sheet of paper.

a. How many different ways can the *D*s and *R*s be recorded if Sandra guesses which cups have diet pop and which cups have regular pop?

(2)

b. If Sandra knew there were 3 cups of diet pop and 2 cups of regular pop on the table, how many different ways can the *D*s and *R*s be recorded?

2. Children usually attend birthday parties where a thank-you gift is given to the children who attend the party. A family likes to hand out books as thank-you gifts.

(2) **a.** One child invited to the party is given 2 books as a gift. If there were 15 different books to choose from, how many different gifts were possible?

(4) **b.** If the 15 books consisted of 8 non-fiction and 7 fiction, how many different gifts were possible if at least 1 of the 2 books were fiction?

(2)

3. Some people have to travel away from home for their jobs. Companies may find that expense claims vary greatly from person to person and are dependent on the destination, cost of food, and type of transportation used.

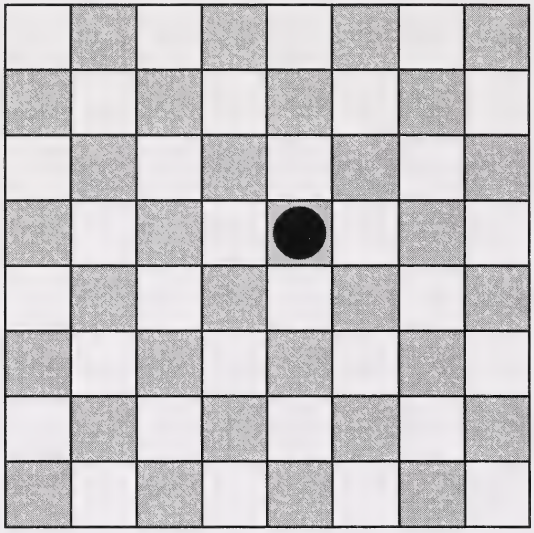
A particular company wanted to analyse expense claims. It studied the major cities that its employees travelled to the most: Edmonton, Calgary, and Vancouver. The employees either travelled by plane or private car and accounted for either their meals or the cost of transportation within each city. Draw a tree diagram to represent the different combinations within this study.

(2)

4. Jamie is in a hurry to tidy up. Without looking at the cases of 3 CDs, Jamie just puts the CDs into the cases. (The cases belong to the 3 CDs.) How many different ways can the 3 CDs be put into the cases?

(3)

5. a. The following diagram shows a checkerboard. The pieces on a checkerboard can only be moved diagonally along coloured squares one square at a time. How many different paths are there for the piece on the spot indicated to be moved to the bottom of the checkerboard?



(3)

b. Explain whether or not you can determine where this piece was first placed on the board. How many paths were possible to get from the top of the checkerboard to where the piece is shown?

(3) **6.** Expand $(x-4)^5$.

(2) **7.** Determine the constant term in the expansion of $(x+2)^9$.

Pure Mathematics 30
Assignment Booklet 6B
Module 6

2000

LRDC

0008